JOURNAL OF INTERNATIONAL CRISIS AND RISK COMMUNICATION RESEARCH
2019, VOL. 2, NO 2, 149–180
https://doi.org/10.30658/jicrcr.2.2.1

Nicholson School of Communication and Media
University of Central Florida
www.jicrcr.com

Crisis Frame Dynamics: Frame Diversity in News Media and the Role of Governmental Actors

Fynn Gerken[a] and Toni G. L. A. van der Meer[b]

[a]Department of Accounting and Finance, University of Antwerp, Antwerp, Belgium; [b]Amsterdam School of Communication Research (ASCoR), University of Amsterdam, Amsterdam, the Netherlands

ABSTRACT

This study aims to understand the dynamic evolvement of frames in news media coverage of the Ebola crisis (2014–2015) and their interplay with narratives put forth in press releases from governmental organizations (GOs). An automated content analysis was applied to U.S. newspapers and GOs' press releases on the Ebola epidemic. Time series analyses illustrate how the scope of frames in news media becomes narrower (decreased diversity) with the presence of immediate and problem-focused crisis frames and wider (increased diversity) with more progressive frames. Additionally, the results imply that a level of shared interpretation (frame alignment) between media and GOs fosters the openness of news media for a variety of frames, which in turn might lead to a communicative shift that eases the crisis atmosphere.

KEYWORDS: Crisis communication; framing; news frame diversity; frame alignment; automated content analysis

On March 23, 2014, the World Health Organization (WHO, 2015) reported on the first cases of Ebola in West Africa. The emergence and spread of such infectious diseases are characterized by a complex of social, technological, and environmental dynamics that give rise to multiple narratives (Leach, Scoones, & Stirling, 2010). Involved actors (e.g., news media and governmental organizations [GOs]) socially co-construct and develop the meaning of these events in their communication (e.g., Schultz & Raupp, 2010). Their framing of public health crises suggests and promotes certain strategies and interventions that ultimately influence outbreak responses (Leach et al., 2010). This study

CONTACT Fynn Gerken • E-mail: fynn.gerken@uantwerpen.be • Department of Accounting and Finance, University of Antwerp, Prinsstraat 13, 2000, Antwerp, Belgium

aims to understand the dynamic evolvement of frames in news media coverage of the Ebola crisis (2014–2015) and their communicative interplay with narratives put forth in GOs' press releases.

During crises, news media serve as the primary channel for crisis communication (Centers for Disease Control and Prevention, 2014; Glik, 2007) and make crucial information available (Sorribes & Rovira, 2011). In their role as a central realm for negotiating crisis understanding, news media are considered to play a leading role in the construction and evolvement of a crisis (Kleinnijenhuis, Schultz, & Oegema, 2015; Van der Meer, 2016b). They selectively emphasize a specific series of unfolding events and offer interpretations to the public of how to make sense of the situation at play (Van Gorp, 2007). At the same time, GOs, as public service organizations, have the social function to notify other actors about crisis developments and are an important source of information (Liu & Horsley, 2007). During such uncertain times, these organizations also need to come to an understanding of the quickly unfolding events, which they then react to and communicate about, thereby contributing to the construction of the crisis (Schultz & Raupp, 2010).

Framing theory offers a powerful body of literature to study over-time patterns of narratives during crisis episodes (Geiß, Weber, & Quiring, 2016; Kleinnijenhuis et al., 2015; Snow, Vliegenthart, & Corrigall-Brown, 2007) and is a useful theoretical lens to understand health crises such as viral epidemics (e.g., Dudo, Dahlstrom, & Brossard, 2007; Lee & Basnyat, 2013; Luther & Zhou, 2005). Prior research has suggested that the concept of *news frame diversity* can provide important insights into the dynamic crisis coverage by news media (e.g., Geiß et al., 2016), and the concept of *frame alignment* allows the study of the interplay of news media frames with frames promoted by GOs (e.g., Van der Meer, Verhoeven, Beentjes, & Vliegenthart, 2014). Hence analyzing the over-time development of *news frame diversity* and *frame alignment* promises novel insights into the complex crisis frame dynamics in news media and the communicative role of GOs. First, through the concept of *news frame diversity*, the variety of ways in which an event is framed in news media can be studied (Geiß et al., 2016; Huang, 2010). Previous studies have demonstrated that news media have a limited carrying capacity

(Zhu, 1992; Zhu & McCombs, 1995) and that specific interpretations of important events are able to temporarily displace other alternative views around the issue (Geiß et al., 2016). During epidemic outbreaks, these dominant interpretations can obscure alternative narratives that put forth, for example, different causes or solutions to the crisis (Leach et al., 2010). Therewith, a drop in diversity (i.e., the predominance of a few major problems or a single issue or interpretation) might have real consequences for the range of crisis responses that are implemented. Investigating what types of interpretations can cause the news media to narrow (or widen) their scope of frames can help understand what drives the uniformity (or plurality) of presented viewpoints in news media coverage during crises.

Second, the concept of *frame alignment* is useful to explore the communicative interplay between actors, such as news media and GOs, by means of frame comparison (Snow, Rochford, Worden, & Benford, 1986). The alignment of frames can be considered to indicate an increase in mutual understanding of a crisis that helps to ease the crisis atmosphere (e.g., Van der Meer et al., 2014). Hence, in crisis situations, it might be especially important how actors collectively define, understand, and frame the crisis (Schultz & Raupp, 2010; Weick, 1988). To date, however, research has not investigated how the framing of public health crises in the news media relates to news media's communicative interaction with GOs. It remains unclear whether a degree of openness for alternative views on a particular issue in news media (*news frame diversity*) results in shared interpretations across actors (*frame alignment*) or if a level of shared interpretations motivates news media to open up for varying views. Thus more advanced over-time analyses are needed to understand the causal link between news frame diversity and frame alignment.

To shed light on the dynamic evolvement of frames in news media coverage of crises and their interplay with narratives put forth in press releases from GOs, the following research question is addressed: How does the frame diversity in news media coverage in times of crisis relate to the presence of individual news frames and alignment with frames offered by GOs? To answer the question, this study relies on automated content analysis of a long-standing crisis (the Ebola crisis), studying

the framing dynamics between U.S. news media and GOs throughout 54 weeks of the crisis.

Theoretical Framework

Framing

Framing theory offers a useful theoretical lens to investigate the dynamic process of meaning construction and negotiation (Gamson & Modigliani, 1989). In current research, Entman's (1993) definition of framing has established itself as a common reference:

> To frame is to select some aspects of a perceived reality and make them more salient in the communicating text, in such a way as to promote a particular problem definition, causal interpretation, moral evaluation and/or treatment recommendation for the item described. (p. 52)

The idea of selection and salience implies that framing can increase attention to specific aspects of an issue and minimize attention to others (Cappella & Jamieson, 1997). By bringing certain aspects to attention (De Vreese, 2005), frames help individuals to organize a series of events, ascribe meaning to them, and guide action (Benford & Snow, 2000).

A substantial number of studies have utilized framing to study health-related issues, such as obesity (e.g., Hawkins & Linvill, 2010), breast cancer (e.g., Andsager & Powers, 1999), and tobacco control (e.g., Niederdeppe, Farrelly, Thomas, Wenter, & Weitzenkamp, 2007). Yet, framing in severe health crises is much more dynamic given the dramatic nature of the events (Lee & Basnyat, 2013). Therefore a subset of research has focused more directly on frames in news coverage of infectious diseases (e.g., Dudo et al., 2007; Luther & Zhou, 2005; Shih, Wijaya, & Brossard, 2008; Tian & Stewart, 2005) and compared these to frames in GOs' press releases (e.g., Lee & Basnyat, 2013; Rossmann, Meyer, & Schulz, 2018). Combined, the predominance of framing theory in studies of news media coverage and effects in the health literature demonstrates the value of this theoretical lens for examining news media coverage during the Ebola crisis. However, the majority of these studies have applied a deductive approach to classify frames (i.e., relied

on predefined frames) with few exceptions (e.g., Tian & Stewart, 2005). In contrast to this body of research, the present study identifies frames inductively, which results in more issue-specific frames that are directly related to the Ebola crisis.

News media's crisis framing. In general, news media are an important source for health information (Andsager & Powers, 1999; Viswanath & Emmons, 2006), and even more so during crisis and risk situations (Thomas, Friedman, Brandt, Spencer, & Tanner, 2016). News media can shape public opinion by calling attention to certain issues (McCombs & Shaw, 1972), offering interpretations of events (Van Gorp, 2007), and advising protective action (Liu, Fraustino, & Jin, 2015). Often, the public's meaning construction and actions are based on information provided by news media (Sorribes & Rovira, 2011). News media make sense of incidences and organize them into a meaningful succession, thereby influencing the construction of reality (Hallahan, 1999).

The influence of media frames on the public might be particularly pronounced during epidemics because the public has no direct experience with the pressing topic (Ball-Rokeach & de Fleur, 1976; Shih et al., 2008). Depending on the salience of an epidemic on the media's agenda, coverage can heighten or reduce the public's risk perception (Dudo et al., 2007; Kilgo, Yoo, & Johnson, 2018). Applying Iyengar's (1991) classification of generic frames into episodic (i.e., single, specific event-driven cases) and thematic frames (i.e., placing events into an overriding issue), Dudo et al. (2007) found that U.S. news coverage of the avian flu was dominantly episodic. Because episodic frames present specific event-focused cases and focus on emotions and sensationalism (De Vreese, Peter, & Semetko, 2001), this kind of frame might hinder informed judgment about risks associated with the crisis (Dudo et al., 2007). Thus news media, in their coverage and framing, can spark or prevent crisis escalation and ultimately impact the crisis evolvement (Schultz, Kleinnijenhuis, Oegema, Utz, & van Atteveldt, 2012).

GOs' crisis framing. GOs are another key actor in times of crisis. As public organizations, they are a key holder of information and have the social function to communicate quickly as an objective and trustworthy source to protect the public (Liu & Horsley, 2007). Press releases serve as a vehicle for health organizations to inform the public through the

media (Rossmann et al., 2018). Their communication aims to notify the public about the actions the public should take, for example, to avoid physical harm (Coombs, 2007). Furthermore, to reduce psychological stress among the public, GOs are expected to disclose actions that are implemented to solve the problem and prevent similar occurrences in the future (e.g., Kim & Liu, 2012).

Crisis framing across actors. Frames assist actors to communicate via various platforms and come to a (shared) understanding of a crisis (Schultz & Raupp, 2010; Weick, 1988) and ultimately decrease uncertainty (Leydesdorff & Ivanova, 2014). These frames can differ between actors per crisis phase (Van der Meer et al., 2014) because crisis actors provide competing interpretations (Seeger, 2002). While news media frequently use frames offered by sources such as GOs, they might also adapt these frames (Lee & Basnyat, 2013; Vasterman & Ruigrok, 2013). Hence frames are the result of communicative negotiation processes over meaning between the media and their sources (Vliegenthart & van Zoonen, 2011). Studying frames of news media and GOs thus promises useful insight into how central actors made sense of the Ebola crisis and how meaning construction evolved as the epidemic unfolded.

Yet, research into framing across news media and GOs has been limited, with few exceptions (e.g., Lee & Basnyat, 2013; Rossmann et al., 2018; Vasterman & Ruigrok, 2013). Rossmann et al. (2018) found that European news coverage during the H1N1 epidemic more frequently emphasized risks, while press releases by GOs framed the crisis more dominantly in risk-attenuating terms. In contrast, Vasterman and Ruigrok (2013) found that while Dutch news media coverage during the H1N1 crisis frequently featured alarming frames, the coverage was not more alarming than its news sources. In addition, Lee and Basnyat (2013) traced press release of GOs in Singapore to news stories of the H1N1 crisis, showing that journalists very selectively use provided information and change the frames they use in coverage.

To reach a closer understanding of how news media covered the Ebola crisis and how GOs communicated about the epidemic, it is important to analyze the frames that both actors constructed. Therefore the first research question asks the following:

RQ1: What frames are constructed by news media and GOs during the Ebola crisis?

News Frame Diversity

Research into communicative diversity in terms of actors, issues, and frames in communication has its origins in agenda-setting research (e.g., Jennings, Bevan, & John, 2011; Zhu, 1992). The concept of news frame diversity focuses on the heterogeneity of news media framing and can be conceptualized as the semantic variety of frames present in a text (Huang, 2010). Variety of frame presence in news media coverage can be considered along a continuum from the dominance of a single frame (i.e., low news frame diversity) to complete heterogeneity of frames (i.e., high news frame diversity; Entman, 2003). Because the framing environment is contested with differently strong frames competing in news coverage for dominance (Chong & Druckman, 2007), news frame diversity closely relates to the idea of a zero-sum dynamic in news media, where a rise in salience of one aspect or interpretation of a subject comes at the cost of the salience of another (Zhu, 1992; Zhu & McCombs, 1995).

Previous research has indicated that news frame diversity can provide important insights into the dynamic crisis coverage by news media (e.g., Geiß et al., 2016) and that the limited presence of alternative information can have consequences for crisis development (e.g., Kleinnijenhuis et al., 2015; Suedfeld & Tetlock, 1977) and solutions (Leach et al., 2010). When major events take place, minor items are pushed from the news media agenda by breaking news (Berkowitz, 1992). For instance, news broadcasts may devote the majority of their time to a segment about the Ebola outbreak. The audience can infer from this predominance of a single issue that a new crisis occurred (Kleinnijenhuis et al., 2015). In a similar vein, dramatic events during crises, such as the diagnosis of Ebola on U.S. soil, can lead to a temporary rise of only a few frames focusing on key elements of the issue (Scheufele, 2006). The resulting drop in diversity (i.e., the predominance of a single issue or interpretation) thus suggests a focus on a few major problems

(rather than a variety of minor issues), which signals an increase in crisis intensity (Kleinnijenhuis et al., 2015).

More fundamentally, the narrow focus on problems can have real consequences for crisis outcomes. Often, policy decisions and interventions during epidemics are based on a narrow subset of potential courses of actions because actors and institutions "close down" around a limited number of narratives (Stirling, 2008). However, as long as a narrow focus on a few interpretations persists, "a trade-off with the issues of other stakeholders is more unlikely" (Kleinnijenhuis et al., 2015, p. 4) and thus alternative solutions remain absent. Particularly, health crises such as Ebola may require a greater openness to alternative narratives that "highlight issues, understandings and forms of knowledge which are vital to ensure that outbreak responses are attuned to local ecological and social circumstances, and so actually work" (Leach et al., 2010, p. 375). Therefore, to respond appropriately to epidemics, it might be detrimental for news media to fail to move beyond a singular narrative and embrace alternative viewpoints (Leach et al., 2010; Stirling, 2008).

Despite this evidence, little research has investigated what communication patterns result in a drop or rise in news frame diversity. Research by Geiß et al. (2016) provided evidence about the successfulness of frames that were promoted by influential actors to temporarily displace alternative frames around important events. Focusing on the health context, the present study investigates what interpretations cause news media to narrow or widen their scope of frames during crises. The second research question, therefore, asks the following:

> **RQ2:** What type of crisis frames are associated with a rise or drop in frame diversity in news media coverage?

Frame Alignment

Besides the variety of frames in news media, the similarity of frames between actors can offer further understanding of the communicative crisis process. During crises, actors desire to resolve differences and come to a collective understanding of ambiguous and confusing events (Snow et al., 1986; Van der Meer et al., 2014). After individual meaning production, actors engage in collective sense making, which

is likely to result in a temporal construction of similar frames (Van der Meer et al., 2014). This similarity in frame construction can be understood as frame alignment. Therefore, in this article, frame alignment is conceptualized as the similarity in presence of comparable frames in actors' communication about a certain event. Previous studies have already provided qualitative (Snow et al., 1986) and quantitative (Van der Meer et al., 2014) evidence for different degrees of frame alignment throughout crises.

The level of alignment can also have substantial consequences for crisis development. As long as confusion and incoherence are the prevailing states of crisis, a solution to the crisis is improbable (Weick, 1988). Before a crisis can be solved, actors need to reach a degree of consensus about what happened and what the complex events mean (Van der Meer et al., 2014). As interpretations of events become more similar, resulting in frame alignment, actors can reach a shared understanding (Snow et al., 1986) to avoid further escalation (Weick, 1988), creating a precondition for crisis resolution.

Frame Alignment and News Frame Diversity

Prior literature indicates that both shared interpretations between actors (frame alignment; Snow et al., 1986; Van der Meer et al., 2014; Weick, 1988) and a diverse set of presented viewpoints in news media (high news frame diversity; e.g., Huang, 2010; Kleinnijenhuis et al., 2015; Wong, Ormiston, & Tetlock, 2011) are important preconditions for relaxing the crisis atmosphere. However, it remains unclear whether a plurality of perspectives in news media (high news frame diversity) results in shared interpretations across actors (frame alignment) or if a level of shared interpretations motivates news media to open up for varying views.

On one hand, it is plausible that the media debate first needs to open up to a broader set of perspectives (frame diversity) before they can reach a level of shared interpretation of events with GOs (frame alignment). As the crisis develops, news media coverage might move away from the few dramatic interpretations of the events and turn toward a greater variety of explanations. With the increasing diversity, an increase in perspectives is stimulated and openness for new

information motivated (Wong et al., 2011). The necessary "space" in the news media debate might be created for GOs' frames to become salient. The openness, in turn, might motivate actors to interact (Kleinnijenhuis et al., 2015), which might stimulate a shared understanding of what the events signify and result in a rapprochement of actors' frames (Van der Meer et al., 2014).

On the other hand, shared interpretation among GOs and news media (frame alignment) might be a precondition for media to move away from homogeneous framing and a crisis atmosphere to open up for multiple interpretations and viewpoints (frame diversity). Frame alignment with GOs might have a calming impact on the news media coverage and scope of frames, thereby increasing frame diversity. In the midst of a crisis, media are often focused on the dramatic nature of the events (Reintjes et al., 2016) and thus might initially neglect the information and interpretations offered by the GOs. However, once news media open up to these interpretations and reach a level of mutual understanding, there may be a calming impact on news media coverage, allowing a shift of attention to alternative interpretations. Thus, with the widening of opinions away from the narrow set of problems, possible solutions can be discussed and the crisis atmosphere eases (Kleinnijenhuis et al., 2015). To disentangle this complex communicative process, the third research question is formulated as follows:

> **RQ3:** How does frame diversity in news media in times of crisis relate to the alignment with frames offered by the GOs?

Method

Data Collection

To answer the research questions, an automated content analysis of U.S. newspaper coverage and GOs' press releases was conducted. The Ebola crisis was selected as a case because the epidemic provides a unique opportunity to study the dynamic crisis coverage of news media and examine how news reporting affects (or is affected by) interaction with GOs. The crisis began in March 2014 when the first cases were reported in Guinea (WHO, 2015). While the majority of cases were

reported in West Africa, attention in the United States was especially high when four people were diagnosed with the virus in the United States in September and October 2014. Given the significance and the scale of the outbreak, the crisis offers an interesting context to answer this study's research questions.

Newspaper articles and press releases were collected between June 29, 2014, when attention started to increase in U.S. news media, and July 5, 2015, when attention faded away, indicated by a decreasing number of articles about the epidemic. Five U.S. newspapers with complete articles on LexisNexis were selected (the *New York Times*, *Washington Post*, *USA Today*, *Daily News* [New York], and *New York Post*). Relevant articles were selected by applying a search string containing the words "Ebola," "EVD" (for Ebola virus disease), or "EHD" (for Ebola hemorrhagic disease). This resulted in a total sample of 1,079 newspaper articles. In total, four GOs were selected (the United Nations, WHO, World Bank, and Centers for Disease Control and Prevention). Their websites were searched for press releases about the outbreak, resulting in a total sample of 324 press releases.

Operationalization

Frames. This study applies an inductive method to automatically identify frames in actors' crisis communication. More specifically, a semantic network analysis was conducted, identifying latent patterns in text based on word (co-)occurrences (Hellsten, Dawson, & Leydesdorff, 2010). This automated approach draws on the idea that a text can be seen as a network of words that conveys their meaning, with each network serving as an indicator for the frame they represent. By clustering groups of correlating words, a higher order structure in text and between text can be identified and frames detected (Hellsten et al., 2010). In other words, analyzing the (co-)occurrence of words allows one to quantify meaning in measurable units of analysis, thereby avoiding subjective bias. Research has already successfully applied this method, for instance, to compare discourses (Leydesdorff, 2005) or to explore crisis frames (Gerken, Van der Land, & Van der Meer, 2016; Van der Meer, 2014; Van der Meer et al., 2014). Thus frames in this research will be operationalized as (co-)occurrences in communication, which

generate latent semantic networks that convey their meaning (adapted from Hellsten et al., 2010).

The main premise of such automated approaches is that documents can be considered as a *bag of words* where a set of words is sufficient to understand the meaning of a text (e.g., Grimmer & Stewart, 2013). This idea is in line with the underlying theoretical assumptions of framing theory that "text contains frames, which are manifested by the presence or absence of certain keywords, stock phrases, stereotyped images, sources of information, and sentences" (Entman, 1993, p. 52; for a more detailed description of why frames can be analyzed in this way, see Grimmer & Stewart, 2013; Hellsten et al., 2010; Van der Meer, 2016a).

The automated approach requires several practical steps (Vlieger & Leydesdorff, 2011). In this study, frames were identified in all actors' documents combined. First, a frequency list containing the 255 most frequently used words was created. Common/meaningless words, organizational names, and search strings were removed with a stop-word list, and words were reduced to their base forms. Second, after a manual revision, a document–term occurrence matrix was conducted. Third, the matrix was used to conduct principal component factor analysis. To maximize the variable loadings on each factor, Varimax rotation was selected. The retrieved components represent the frames. Through an iterative process, 11 meaningful frames were inductively identified. Finally, labels were assigned to the frames according to the words that are part of the word clusters that make up the frame.

Frame diversity. Research into communicative diversity (e.g., agenda diversity and frame diversity) relates to the idea that a difference in presence can be observed for a defined number of categories (e.g., Kleinnijenhuis et al., 2015). In this study, frame presence was measured in the frequency of occurrence of each frame, in terms of articles that contained a particular frame.

To analyze the frequency of occurrence in U.S. news media, AmCat (the Amsterdam Content Analysis Toolkit; cf. van Atteveldt, 2008) was utilized. First, for each frame, a search string was created, combining the words that are part of the word clusters (or frame) in Apache Lucene query language with Boolean operators (AND, OR) and wildcards (*, ?). Words with factor loadings above .50 were combined with the operator

AND, and words relating to the same concept (e.g., traveler, passenger) combined with OR. The search queries were developed, tested, and improved using samples from the population to ensure the validity of the search strings. Second, all news documents were searched for the presence of these frames in AmCat. The tool kit construed a data matrix with rows representing the time (weekly level) and columns representing frame presence, indicating the variety of frames present in a given week. Third, to calculate frame presence and their prominence in relation to one another, the Shannon and Weaver (1949) entropy measure was used. This is a widely used measure for agenda and frame diversity (e.g., Huang, 2010; Jennings et al., 2011; Kleinnijenhuis et al., 2015; Zhu & McCombs, 1995).

Frame alignment. The concept of frame alignment relates to the idea that different actors construct and use frames that differ in their level of similarity at certain points in time (Van der Meer et al., 2014). This study sets out to measure this similarity in framing by comparing frame presence across actors over time. In other words, by measuring the occurrence of a discrete number of frames for each actor in each defined time period, the presence of frames can be compared across actors.

This analysis is divided into several steps. First, the search strings that were described in the previous section were used to construe a data matrix in AmCat for each actor, with rows representing the time and columns indicating the frame presence. Second, a new data set was created from these matrices, where the cases represent the frames and a variable each actor for every week. The cases could take values of zero or any positive integer, with greater numbers representing a greater frame presence. Third, the extent to which a frame was present in the communication of both actors was tested by means of Pearson's *r* correlations tests, week by week. The correlation scores provided insight into the level of alignment over time.

Analysis

Partial adjustment autoregressive distribution lag (ADL) model. To test the influence of frames on frame diversity in news media (RQ2), a partial adjusted ADL (Koyck) model was estimated (data were

aggregated on a weekly level) with frame diversity as the dependent variable and news frames and attention as independent variables. Augmented Dickey–Fuller test for unit root (stationarity) was conducted, and the series was tested for absence of autocorrelation in residuals (i.e., white noise).

Vector autoregression (VAR). Following previous research (e.g., Kleinnijenhuis et al., 2015), a VAR model was estimated to test the causal RQ3. The analysis tests for bidirectional causality in time series data (aggregated on a weekly level) and consists of a series of ordinary least squares regressions in which each variable is treated as both dependent and independent variable (Vliegenthart, 2014). The model is based on Granger causality, where external causes should only be assumed when the own autoregressive past is not sufficient to explain a current value (Brandt & Williams, 2007). In this model estimation, each value is regressed on its past value and the past value of the endogenous variable as well as the cross-lagged influence of other variables. The variable *x* is assumed to Granger-cause variable *y* if the prediction of *y* based on its previous values is improved by including the previous values of *x* into the equation (Brandt & Williams, 2007). Thus this analysis does not test for actual causation but whether the time series of *x* has predictive information about the time series of *y*.

News frame diversity and frame alignment served as endogenous variables, with news attention (i.e., number of news articles) as an exogenous variable to control for. The logarithm of the variable news frame diversity was entered into the model to account for nonnormal distributions. Dickey–Fuller tests were conducted to test for stationarity. The maximum number of lags was limited to three, with the assumption that a direct impact would only occur within 3 weeks or less (Vliegenthart, 2014). The final lag length included in the model was determined by the Akaike information criterion (e.g., Vliegenthart, 2014). Tests for the absence of autocorrelation (in residuals) were conducted.

TABLE 1 *Identified Frames in News Media and GOs' Communication*

Frame	Example indicators	Occurrence[a]		
		News	GOs	Total
Support, $R^2 = 8.39$	support, countries, community	71 (6.58%)	165 (50.93%)	236 (16.82%)
Victim, $R^2 = 4.95$	family, sick, Liberia	58 (5.38%)	2 (0.62%)	60 (4.28%)
Protection, $R^2 = 2.92$	protect, training, worker	136 (12.6%)	12 (3.7%)	148 (10.55%)
Intensification, $R^2 = 2.39$	Texas, Duncan, hospital	175 (16.22%)	0 (0%)	175 (12.47%)
Outbreak, $R^2 = 2.14$	Leone, border, capital	164 (15.2%)	35 (10.8%)	199 (14.18%)
Contagion, $R^2 = 1.84$	disease, spread, infected	430 (39.85%)	101 (31.17%)	531 (37.85%)
Local infections, $R^2 = 1.62$	Spencer, Bellevue, quarantine	38 (3.52%)	0 (0%)	38 (2.71%)
Politics, $R^2 = 1.55$	Obama, president, house	89 (8.25%)	2 (0.62%)	91 (6.49%)
Prevention, $R^2 = 1.4$	screening, airport, temperature	21 (1.95%)	1 (0.31%)	22 (1.57%)
Research, $R^2 = 1.32$	vaccine, trial, research	39 (3.61%)	4 (1.23%)	43 (3.06%)
Consequences, $R^2 = 1.31$	economic, million, impact	15 (1.39%)	57 (17.59%)	72 (5.13%)

Note. GO = governmental organization.

[a]Cells contain the number of documents with identified frames. Percentages in parentheses are calculated based on frame presence relative to overall number of identified documents per actor to enable comparison.

Results

Frames in Communication (RQ1)

A semantic network analysis was conducted that investigated the frames that were constructed by both actors. In total, 11 frames were identified and labeled, and their presence in communication was analyzed to answer RQ1. Table 1 displays the frame presence in communication from news media and GOs. In terms of frame presence, the results reveal that news media dominantly focused on the spreading virus and its related risks (contagion frame: 39.85%). To put it differently, the contagion frame is present in 39.85% of the newspaper articles sampled. In addition, frames about the pandemic outbreak in Africa (outbreak frame: 15.2%), the first U.S. case that intensified the crisis (intensification frame: 16.22%), and the measures that need to be taken to protect patients and health personnel (protection frame: 12.6%) were high on the news media agenda. In contrast, GOs heavily emphasized the need for international support (support frame: 50.93%).

Moreover, GOs strongly focused on the development of the virus and its risk (contagion frame: 31.17%), the economic consequences of the crisis (consequence frame: 17.59%), and the pandemic outbreak center in Africa (outbreak frame: 10.8%). In sum, it becomes evident that while some frames are only (or more strongly) emphasized by the individual actors, others were high on both agendas (e.g., outbreak frame, contagion frame).

Frames and News Frame Diversity: Partial Adjusted ADL Model (RQ2)

To provide insight into framing dynamics during a crisis, the association between the specific news frames and news frame diversity was analyzed, answering RQ2. The partial adjusted ADL model is presented in Table 2 with news frame diversity serving as the dependent variable and a fraction of its past value and the identified news frames as independent variables. In addition, news attention is incorporated as a control variable in this analysis.

The reported coefficient of the autoregressive term (L. news frame diversity) indicates that news frame diversity was not an autoregressive

TABLE 2 *Partial Adjustment Autoregressive Distribution Lag Model Predicting News Frame Diversity Based on Identified Frames*

	News frame diversity
L. news frame diversity	0.05 (0.141)
News frame	
Support	0.51 (0.07)**
Victim	0.60 (0.08)**
Protection	0.37 (0.06)
Intensification	−1.26 (0.40)*
Outbreak	−0.28 (0.04)
Contagion	−1.63 (0.04)**
Local infections	−0.29 (0.05)
Politics	0.59 (0.07)
Prevention	0.10 (0.06)
Research	0.16 (0.12)
Consequences	0.11 (0.17)
News attention	1.70 (0.02)*
R^2	0.58

Note. Cells contain standardized (β) regression coefficients with standard errors (*SE*). The independent trend variable and constant are absent from this table.

*$p < 0.10$. **$p < .05$.

process ($\beta = 0.05$, $p = .72$), meaning that past values are not predictive of future values. Thus it seems that the development of frame diversity in news media over time was dynamic and random, corresponding to a degree of instability in the crisis development. In addition, the results provide evidence that the rise of certain frames can decrease the variety of frames present in news media coverage. More specifically, an increase in presence of the contagion frame in news media was associated with a significant decrease in news frame diversity ($\beta = -1.63$, $p < .01$). This suggests that when frames with words emphasizing the contagious nature of the virus, such as *disease*, *spread*, and *infected*, were increasingly present in the coverage, other frames were

pushed from the media agenda. Similarly, a rise of the intensification frame in news media was associated with a decrease in frame diversity ($\beta = -1.26$, $p < .10$).

An opposite effect, however, is evident for other frames. The results reveal that greater presence of the support frame was associated with a significant increase in frame diversity in news media coverage ($\beta = 0.51$, $p < .01$). This demonstrates that when news reporting increasingly made the need for the international support of the affected countries salient by using words such as *support*, *countries*, and *community* (support frame), the variety of frames also increased. Moreover, the results suggest that a rise in presence of the victim frame was also associated with a significant increase in news frame diversity in news coverage ($\beta = 0.60$, $p < .01$). Specifically, increasing emphasis in words such as *family*, *sick*, and *Liberia* in the news highlighting the need for help (victim frame) resulted in more heterogeneous framing in news media coverage. In sum, the findings of this analysis expose a framing process where the rise of certain frames pushes other frames from the agenda, thereby decreasing news frame diversity, whereas other frames seem to allow a plurality of frames in news media that coexist alongside each other.

Frame Alignment and News Frame Diversity: VAR Model (RQ3)

To explore the relationship between frame alignment and news frame diversity, a VAR model was estimated. Table 3 displays the estimated reciprocal effects of the two dependent variables. In addition, news attention was included in the model as an exogenous variable. The model is absent of autocorrelation and heteroscedasticity, as indicated by the Ljung–Box *Q* test and the Lagrange multiplier test (Vliegenthart, 2014), revealing that the model is well specified. Moreover, the model explains a considerable amount of variance of both series, with an R^2 value of .19 for new frame diversity and .41 for frame alignment.

The Granger causality test hints that frame alignment Granger-causes news frame diversity, indicated by the significant effect. Hence the prediction of news frame diversity is increased by taking into account the level of frame alignment between the actors in the previous

TABLE 3 *Granger Causality Tests for Frame Alignment and News Frame Diversity*

	Frame alignment	News frame diversity
Frame alignment: Granger		6.56*
News frame diversity		
Granger	0.19	
Ljung–Box *Q*(20)	16.56	17.86
Lagrange *M*-test (20)	21.38	14.90
AIC	25.55	
BIC	38.65	
R^2	0.19	0.41

Note. The model includes the news attention as an exogenous variable. The AIC suggests that a model with one lag is the most appropriate. AIC = Akaike information criterion. BIC = Bayes information criterion.

*$p < .05$.

week. A reversed effect of news frame diversity on frame alignment is not observed, indicating an asymmetrical relationship where only the time series of frame alignment contains information about the time series of frame diversity in news media coverage.

This is also reflected in Figure 1, which displays the times series for news frame diversity and frame alignment with transformed *z*-scores. The graph shows that changes in frame alignment often preceded changes in news frame diversity, which suggests that an increase (decrease) in frame alignment resulted in an increase (decrease) in news frame diversity. An impulse response function provides further insight. The function indicates that a 1-point increase in frame alignment triggered an increase in .28 of news frame diversity in the following week. While the effect is positive and immediate, the impact of the effect declines slowly and gradually during the following weeks. In sum, the results indicate that when frames between actors become more similar, the diversity of frames in media increases. In other words, the results suggest that a level of shared interpretations between news media and GOs about what the crisis signifies resulted in more heterogeneous framing in news media reporting, thereby answering RQ3.

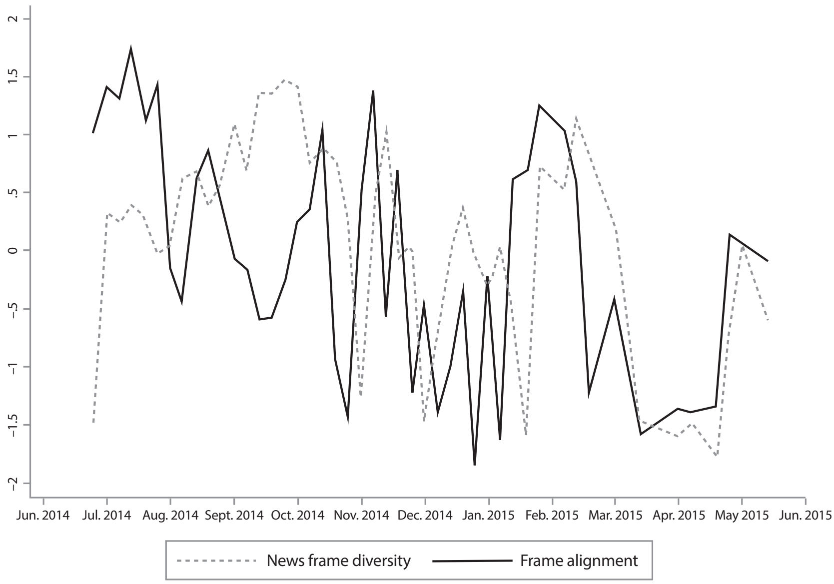


FIGURE 1. Times series for news frame diversity and frame alignment transformed to *z*-scores.

Discussion

The aim of this study was to shed light on the dynamic evolvement of frames in news media coverage of the Ebola crisis (2014–2015) and their interplay with frames promoted in GOs' press releases. First, this study automatically identified frames that both actors had constructed (RQ1). The results reveal that frames such as the outbreak frame and contagion frame were salient in both actors' communication. This seems to align with previous research that found that news media and their cited sources were predominantly alarming during the coverage of the A/H1N1 epidemic (Vasterman & Ruigrok, 2013). Perhaps these frames can be classified by their immediate character and could therefore be considered natural frames caused by the urgency and complexity that result from the occurrence of a crisis, explaining why these frames are prominent in the communication of both actors. At the same time, other frames were actor specific (e.g., GOs: support frame; U.S. news media: intensification frame), revealing differences in framing.

The results suggest that frames that emphasized the perceived intensification of the crisis due to the proximity of the Ebola infections (intensification frame, local infections frame) were strongly present in news media coverage but were largely absent from the GOs' agenda. News coverage seemed to be heavily event driven and sensationalist, with a focus on the hospitalization of U.S. individuals. In contrast, GOs' press releases seemed to have focused on local interventions (support frame) and broader economic consequences (consequences frame). Considering Iyengar's (1991) previously applied typology of episodic and thematic frames, it seems news media coverage was more episodic compared to GOs' press releases. While this stands in contrast to findings of Lee and Basnyat (2013) in the context of the H1N1 crisis, it supports the results of Dudo et al. (2007) on the avian influenza coverage.

This might suggest that GOs paid little attention to local incidents, possibly because the millions of cases in West Africa outweighed the few U.S. infections. GOs might focus more strongly on providing detailed information that is cross-validated and placing the events in a broader global context (i.e., focus on thematic framing) rather than spreading the newest developments in the crisis that can potentially cause public panic. This explanation might indicate GOs' awareness of their public function as an expert information source and regulator of public understanding.

Second, a partial adjusted ADL model was estimated, investigating the relationship between the presence of identified news frames and news frame diversity (RQ2). The results indicate that individual frames have the potential to narrow or widen the media's scope of frames and therewith intensify or ease the crisis atmosphere (Kleinnijenhuis et al., 2015).

On one hand, news frame diversity was decreased by frames that emphasize the dramatic nature of the crisis and put specific events and individuals at the center of reporting. Specifically, with an increasing focus on the spread of the highly contagious virus (contagion frame) and the first infections within the United States (intensification frame), framing in news coverage became more homogenous. This observation is in line with previous research that has suggested that news coverage during health crises is driven by specific incidents (Dudo et

al., 2007; Shih et al., 2008) and that key events can lead to a focus on fewer, event-oriented frames (Scheufele, 2006). The drop in news frame diversity can, therefore, possibly be attributed to the intensification of the situation. A perceived crisis escalation might have resulted in a narrow focus (Suedfeld & Tetlock, 1977) and fostered a concentration on problems (e.g., Kleinnijenhuis et al., 2015). Owing to the limited capacity of news media (Zhu, 1992; Zhu & McCombs, 1995), alternative viewpoints and interpretations remained absent, crowded out by these predominant negative and sensational frames (Entman, 2003). Thus the results also correspond with seminal research that has indicated that specific crisis frames have the potential to temporarily displace alternative interpretations (e.g., Geiß et al., 2016) and conceal narratives that promote alternative solutions to epidemics, such as local interventions in Africa, that are context specific and address long-term implications (Leach et al., 2010).

On the other hand, a rising emphasis on frames that focus more strongly on the crisis progress and highlight the help needed for victims (i.e., support frame and victim frame) increased news frame diversity. This suggests that with the increasing presence of more constructive news frames that emphasized the importance of supporting the affected countries (support frame) and highlighted the impact of the crisis on a broader scope (victim frame), the variety of narratives and interpretation also increased. These latter frames seem to have made the process and development of the crisis salient from a wider and more inclusive perspective, emphasizing the global scale of the events and introducing possible solutions into coverage. Perhaps, these frames could therefore be considered progressive frames. This effect might be related to a progressing dialogue and exchange of information. Previous research has observed that with the advancement of the crisis, news media coverage became less alarming (Vasterman & Ruigrok, 2013) and more open to a diverse set of narratives (Kleinnijenhuis et al., 2015), which increased diversity and fostered a variety of perspectives on the situation (Wong et al., 2011). Thus it may be that as the news media turned to the discussion of solutions, frame diversity increased. An alternative explanation, however, should not be neglected. It is also plausible that the presence of these two frames simply coincided with phases of higher

frame diversity in news media reporting, which created the necessary space in coverage for these alternative perspectives to arise.

Finally, a VAR model was estimated to analyze the relationship between the level of frame alignment between actors and news frame diversity (RQ3). The underlying question was whether heterogeneity in perspectives in news media (high news frame diversity) creates the basis for shared understanding about the events across actors (frame alignment) or if a degree of shared interpretation of the crisis is at the core of the media being open for a variety of interpretations. The model provides evidence that an increase in frame alignment between GOs and media produced greater frame diversity in news media. The direction of the relationship seems to suggest that in the development of a crisis, a degree of mutual understanding between actors about the meaning of the events (Hellsten et al., 2010; Snow et al., 2007; Van der Meer et al., 2014) is instrumental for news media to open up for diverse narratives. Specifically, the rapprochement between the frames that were offered by GOs and the frames present in news media coverage appeared to have had a soothing effect on the news media coverage, triggering a phase in which a variety of alternative information and perspective were covered in the news. In times of crisis, news media seem to reflect the social negotiation of how to frame the critical situation at play rather than lead how to interpret and communicate about the crisis. The degree of alignment might have served as an indicator for involved actors that a degree of consensus had been reached (Van der Meer et al., 2014), the situation de-escalated (Weick, 1988), and crisis atmosphere can ease.

The results of this study contribute to the body of literature on crisis communication as well as framing theory and have certain practical implications. First, the findings enrich the crisis literature by providing further insight into the dynamic news media crisis coverage and how it was affected by interaction with GOs. Epidemic outbreaks are dynamic and complex processes with a variety of competing narratives (Leach et al., 2010). This study applied time series analysis to provide insight into the interaction of different frames, thereby answering the call for a more complex and dynamic investigation of the communicative interplay between actors in times of crisis (e.g., Schultz et al., 2012). Second, this

study contributes to the literature on an empirical level by proposing an innovative way to quantify the presence of automatically identified frames in a large number of texts. In contrast to the majority of previous framing research on epidemics, this study followed an inductive approach to identify frames, enabling the recognition of the full variety of frames specific to the Ebola crisis (Semetko & Valkenburg, 2000). Future health crisis research might benefit from applying a similar approach to identify frames unique to the crisis under study. Third, by focusing on organizations from the public sector, this study started to fill an important gap and enhances understanding of GOs' interaction with news media in times of crisis (Liu & Horsley, 2007; Schultz & Raupp, 2010). Based on the results, it seems GOs need to recognize the zero-sum dynamic in media coverage where narratives focusing on the immediate problems of the crisis are likely to dominate news media coverage. This narrow focus might have adverse consequences for the crisis atmosphere and can hinder the emergence of solutions. However, news media coverage appears to become more inclusive of alternative narratives with the emergence of common interpretations across actors. Thus GOs might benefit from adjusting their communication and signal acknowledgment of the immediate problems early to allow a communicative shift toward an alternative more encompassing discourse. By aligning their framing and crisis interpretations to the news media coverage, GOs could stimulate an increase in frame diversity in news media coverage and thereby soothe the crisis atmosphere.

While this study makes some valuable contributions, a number of shortcomings must be considered when interpreting the results. First, the findings relate to a specific context of study, namely, Ebola in the years 2014 and 2015 reported in U.S. newspapers, which limits its generalizability. Second, this study did not differentiate between U.S.-based and international health organizations. Thus future research could analyze whether different framing dynamics can be observed between them. Third, the automated analysis started from the assumption that bags of words are sufficient to retrieve the general meaning of the text. Although this neglecting of syntax enables analyzing a large number of texts (Grimmer & Stewart, 2013), it risks obscuring information. Finally, despite the automatic identification of frames, the analysis faced a degree

of subjective interference because frame presence was identified based on manually created search strings. The method chosen to determine the strings resulted, for some frames, in a limited number and selective combination of words, which might have influenced the findings. Therefore future research should validate the results and see whether the findings of the Ebola crisis also hold in other crisis situations.

Conclusion

To conclude, this study provides insight into the underlying communicative dynamics between news media and GOs that influence the construction and evolvement of crises over time. Results of analyzing the concepts of news frame diversity and frame alignment in communicative interplay during crisis demonstrate that shared interpretations seem to foster the openness of news media for varying narratives. Therefore timely and constructive communicative interaction between the news media and GOs seems to have a soothing effect on news media coverage.

Fynn Gerken, MSc, is a PhD student in the Department of Accounting and Finance at the University of Antwerp, Belgium. His research interests include the economic consequences of crisis communication, negative events, organizational communication, framing, and news media coverage.

Toni G. L. A. van der Meer, PhD, is assistant professor in corporate communication at the Amsterdam School of Communication Research (ASCoR), Amsterdam, the Netherlands. His research interests include crisis communication, media coverage of negative incidents, news media bias, and mediatization.

References

Andsager, J. L., & Powers, A. (1999). Social or economic concerns: How news and women's magazines framed breast cancer in the 1990s. *Journalism & Mass Communication Quarterly, 76*, 531–550. https://doi.org/10.1177/107769909907600309

Ball-Rokeach, S. J., & de Fleur, M. L. (1976). A dependency model of mass media effects. *Communication Research, 3*(1), 3–21. https://doi.org/10.1177/009365027600300101

Benford, R. D., & Snow, D. A. (2000). Framing processes and social movements: An overview and assessment. *Annual Review of Sociology, 26*, 611–639. https://doi.org/10.1146/annurev.soc.26.1.611

Berkowitz, D. (1992). Routine newswork and the What-a-Story: A case study of organizational adaptation. *Journal of Broadcasting & Electronic Media, 36*, 45–60. https://doi.org/10.1080/08838159209364153

Brandt, P. T., & Williams, J. T. (2007). *Multiple time series models*. Thousand Oaks, CA: Sage. https://doi.org/10.4135/9781412985215

Cappella, J. N., & Jamieson, K. H. (1997). *Spiral of cynicism: The press and the public good*. New York, NY: Oxford University Press.

Centers for Disease Control and Prevention. (2014). *Crisis and emergency risk communication (CERC)*. Retrieved from http://emergency.cdc.gov/cerc/resources/pdf/cerc_2014edition.pdf

Chong, D., & Druckman, J. N. (2007). A theory of framing and opinion formation in competitive elite environments. *Journal of Communication, 57*, 99–118. https://doi.org/10.1111/j.1460-2466.2006.00331.x

Coombs, W. T. (2007). *Ongoing crisis communication: Planning, managing, and responding*. Los Angeles, CA: Sage.

De Vreese, C. H. (2005). News framing: Theory and typology. *Information Design Journal*, *13*(1), 51–62. https://doi.org/10.1075/idjdd.13.1.06vre

De Vreese, C. H., Peter, J., & Semetko, H. A. (2001). Framing politics at the launch of the euro: A cross-national comparative study of frames in the news. *Political Communication, 18*, 107–122. https://doi.org/10.1080/105846001750322934

Dudo, A. D., Dahlstrom, M. F., & Brossard, D. (2007). Reporting a potential pandemic. *Science Communication, 28*, 429–454. https://doi.org/10.1177/1075547007302211

Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication, 43*(4), 51–58. https://doi.org/10.1111/j.1460-2466.1993.tb01304.x

Entman, R. M. (2003). Cascading activation: Contesting the White House's frame after 9/11. *Political Communication, 20*, 415–432. https://doi.org/10.1080/10584600390244176

Gamson, W. A., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology, 95*, 1–37. https://doi.org/10.1086/229213

Geiß, S., Weber, M., & Quiring, O. (2016). Frame competition after key events: A longitudinal study of media framing of economic policy after the Lehman Brothers bankruptcy 2008–2009. *International Journal of Public Opinion Research, 29*, 471–496. https://doi.org/10.1093/ijpor/edw001

Gerken, F., Van der Land, S. F., & Van der Meer, T. G. L. A. (2016). Crisis in the air: An investigation of AirAsia's crisis-response effectiveness based on frame alignment. *Public Relations Review, 42*, 879–892. https://doi.org/10.1016/j.pubrev.2016.09.002

Glik, D. C. (2007). Risk communication for public health emergencies. *Annual Review of Public Health, 28*, 33–54. https://doi.org/10.1146/annurev.publhealth.28.021406.144123

Grimmer, J., & Stewart, B. M. (2013). Text as data: The promise and pitfalls of automatic content analysis methods for political texts. *Political Analysis, 21*, 267–297. https://doi.org/10.1093/pan/mps028

Hallahan, K. (1999). Seven models of framing: Implications for public relations. *Journal of Public Relations Research, 11*, 205–242. https://doi.org/10.1207/s1532754xjprr1103_02

Hawkins, K. W., & Linvill, D. L. (2010). Public health framing of news regarding childhood obesity in the United States. *Health Communication, 25*, 709–717. https://doi.org/10.1080/10410236.2010.521913

Hellsten, I., Dawson, J., & Leydesdorff, L. (2010). Implicit media frames: Automated analysis of public debate on artificial sweeteners. *Public Understanding of Science, 19*, 590–608. https://doi.org/10.1177/0963662509343136

Huang, H. (2010). Frame-rich, frame-poor: An investigation of the contingent effects of media frame diversity and individual difference on audience frame diversity. *International Journal of Public Opinion Research, 22*, 47–73. https://doi.org/10.1093/ijpor/edp024

Iyengar, S. (1991). *Who is responsible? How television frames political issues*. Chicago, IL: University of Chicago Press. https://doi.org/10.7208/chicago/9780226388533.001.0001

Jennings, W., Bevan, S., & John, P. (2011). The agenda of British government: The speech from the throne, 1911–2008. *Political Studies, 59*, 74–98. https://doi.org/10.1111/j.1467-9248.2010.00859.x

Kilgo, D. K., Yoo, J., & Johnson, T. J. (2018). Spreading Ebola panic: Newspaper and social media coverage of the 2014 Ebola health crisis. *Health Communication*. Advance online publication. https://doi.org/10.1080/10410236.2018.1437524

Kim, S., & Liu, B. F. (2012). Are all crises opportunities? A comparison of how corporate and government organizations responded to the 2009 flu pandemic. *Journal of Public Relations Research, 24*, 69–85. https://doi.org/10.1080/1062726X.2012.626136

Kleinnijenhuis, J., Schultz, F., & Oegema, D. (2015). Frame complexity and the financial crisis: A comparison of the United States, the United Kingdom, and Germany in the period 2007–2012. *Journal of Communication, 65*, 1–23. https://doi.org/10.1111/jcom.12141

Leach, M., Scoones, I., & Stirling, A. (2010). Governing epidemics in an age of complexity: Narratives, politics and pathways to sustainability. *Global Environmental Change, 20*, 369–377. https://doi.org/10.1016/j.gloenvcha.2009.11.008

Lee, S. T., & Basnyat, I. (2013). From press release to news: Mapping the framing of the 2009 H1N1 A influenza pandemic. *Health Communication, 28*, 119–132. https://doi.org/10.1080/10410236.2012.658550

Leydesdorff, L. (2005). Metaphors and diaphors in science communication: Mapping the case of stem cell research. *Science Communication, 27*, 64–99. https://doi.org/10.1177/1075547005278346

Leydesdorff, L., & Ivanova, I. A. (2014). Mutual redundancies in interhuman communication systems: Steps toward a calculus of processing meaning. *Journal of the American Society for Information Science and Technology, 65*, 386–399. https://doi.org/10.1002/asi.22973

Liu, B. F., Fraustino, J. D., & Jin, Y. (2015). Social media use during disasters: How information form and source influence intended behavioral responses. *Communication Research, 43*, 626–646. https://doi.org/10.1177/0093650214565917

Liu, B. F., & Horsley, J. S. (2007). The government communication decision wheel: Toward a public relations model for the public sector. *Journal of Public Relations Research, 19*, 377–393. https://doi.org/10.1080/10627260701402473

Luther, C. A., & Zhou, X. (2005). Within the boundaries of politics: News framing of SARS in China and the United States. *Journalism & Mass Communication Quarterly, 82*, 857–872. https://doi.org/10.1177/107769900508200407

McCombs, M., & Shaw, D. L. (1972). The agenda-setting function of mass media. *Public Opinion Quarterly, 36*, 176–187. https://doi.org/10.1086/267990

Niederdeppe, J., Farrelly, M. C., Thomas, K. Y., Wenter, D., & Weitzenkamp, D. (2007). Newspaper coverage as indirect effects of a health communication intervention. *Communication Research, 34*, 382–405. https://doi.org/10.1177/0093650207302784

Reintjes, R., Das, E., Klemm, C., Richardus, J. H., Keßler, V., & Ahmad, A. (2016). "Pandemic public health paradox": Time series analysis of the 2009/10 influenza A/H1N1 epidemiology, media attention, risk perception and public reactions in 5 European countries. *PLoS One, 11*, e0151258. https://doi.org/10.1371/journal.pone.0151258

Rossmann, C., Meyer, L., & Schulz, P. J. (2018). The mediated amplification of a crisis: Communicating the A/H1N1 pandemic in press releases and press coverage in Europe. *Risk Analysis, 38*, 357–375. https://doi.org/10.1111/risa.12841

Scheufele, B. (2006). Frames, schemata, and news reporting. *Communications, 31*, 65–83. https://doi.org/10.1515/COMMUN.2006.005

Schultz, F., Kleinnijenhuis, J., Oegema, D., Utz, S., & van Atteveldt, W. (2012). Strategic framing in the BP crisis: A semantic network analysis of associative frames. *Public Relations Review, 38*, 97–107. https://doi.org/10.1016/j.pubrev.2011.08.003

Schultz, F., & Raupp, J. (2010). The social construction of crises in governmental and corporate communications: An inter-organizational and inter-systemic analysis. *Public Relations Review, 36*, 112–119. https://doi.org/10.1016/j.pubrev.2009.11.002

Seeger, M. W. (2002). Chaos and crisis: Propositions for a general theory of crisis communication. *Public Relations Review, 28*, 329–337. https://doi.org/10.1016/S0363-8111(02)00168-6

Semetko, H. A., & Valkenburg, P. M. (2000). Framing European politics: A

content analysis of press and television news. *Journal of Communication, 50*, 93–1009. https://doi.org/10.1111/j.1460-2466.2000.tb02843.x

Shannon, C. E., & Weaver, W. (1949). *The mathematical theory of communication*. Urbana, IL: University of Illinois Press.

Shih, T.-J., Wijaya, R., & Brossard, D. (2008). Media coverage of public health epidemics: Linking framing and issue attention cycle toward an integrated theory of print news coverage of epidemics. *Mass Communication and Society, 11*, 141–160. https://doi.org/10.1080/15205430701668121

Snow, D. A., Rochford, E. B., Worden, S. K., & Benford, R. D. (1986). Frame alignment processes, micromobilization, and movement participation. *American Sociological Review, 51*, 464–481. https://doi.org/10.2307/2095581

Snow, D. A., Vliegenthart, R., & Corrigall-Brown, C. (2007). Framing the French riots: A comparative study of frame variation. *Social Forces, 86*, 385–415. https://doi.org/10.1093/sf/86.2.385

Sorribes, C. P., & Rovira, S. C. (2011). Journalistic practice in risk and crisis situations: Significant examples from Spain. *Journalism, 12*, 1052–1066. https://doi.org/10.1177/1464884910388233

Stirling, A. (2008). "Opening up" and "closing down": Power, participation, and pluralism in the social appraisal of technology. *Science, Technology & Human Values, 33*, 262–294. https://doi.org/10.1177/0162243907311265

Suedfeld, P., & Tetlock, P. (1977). Integrative complexity of communications in international crises. *Journal of Conflict Resolution, 21*, 169–184. https://doi.org/10.1177/002200277702100108

Thomas, T. L., Friedman, D. B., Brandt, H. M., Spencer, S. M., & Tanner, A. (2016). Uncharted waters: Communicating health risks during the 2014 West Virginia water crisis. *Journal of Health Communication, 21*, 1062–1070. https://doi.org/10.1080/10810730.2016.1209600

Tian, Y., & Stewart, C. M. (2005). Framing the SARS crisis: A computer-assisted text analysis of CNN and BBC online news reports of SARS. *Asian Journal of Communication, 15*, 289–301. https://doi.org/10.1080/01292980500261605

van Atteveldt, W. (2008). *Semantic network analysis: Techniques for extracting, representing and querying media content*. Charleston, SC: BookSurge.

Van der Meer, T. G. L. A. (2014). Organizational crisis-denial strategy: The effect of denial on public framing. *Public Relations Review, 40*, 537–539. https://doi.org/10.1016/j.pubrev.2014.02.005

Van der Meer, T. G. L. A. (2016a). Automated content analysis and crisis

communication research. *Public Relations Review, 42*, 952–961. https://doi.org/10.1016/j.pubrev.2016.09.001

Van der Meer, T. G. L. A. (2016b). Public frame building: The role of source usage in times of crisis. *Communication Research, 45*, 956–981. https://doi.org/10.1177/0093650216644027

Van der Meer, T. G. L. A., Verhoeven, P., Beentjes, H., & Vliegenthart, R. (2014). When frames align: The interplay between PR, news media, and the public in times of crisis. *Public Relations Review, 40*, 751–761. https://doi.org/10.1016/j.pubrev.2014.07.008

Van Gorp, B. (2007). The constructionist approach to framing: Bringing culture back in. *Journal of Communication, 57*, 60–78. https://doi.org/10.1111/j.0021-9916.2007.00329.x

Vasterman, P. L. M., & Ruigrok, N. (2013). Pandemic alarm in the Dutch media: Media coverage of the 2009 influenza A (H1N1) pandemic and the role of the expert sources. *European Journal of Communication, 28*, 436–453. https://doi.org/10.1177/0267323113486235

Viswanath, K., & Emmons, K. M. (2006). Message effects and social determinants of health: Its application to cancer disparities. *Journal of Communication, 56*(Suppl. 1), 238–264. https://doi.org/10.1111/j.1460-2466.2006.00292.x

Vliegenthart, R. (2014). Moving up: Applying aggregate level time series analysis in the study of media coverage. *Quality and Quantity, 48*, 2427–2445. https://doi.org/10.1007/s11135-013-9899-0

Vliegenthart, R., & van Zoonen, L. (2011). Power to the frame: Bringing sociology back to frame analysis. *European Journal of Communication, 26*, 101–115. https://doi.org/10.1177/0267323111404838

Vlieger, E., & Leydesdorff, L. (2011). Content analysis and the measurement of meaning: The visualization of frames in collections of messages. *Public Journal of Semiotics, 3*, 28–50. Retrieved from https://www.leydesdorff.net/semiotics/semiotics.pdf

Weick, K. E. (1988). Enacted sensemaking in crisis situations. *Journal of Management Studies, 25*, 305–317. https://doi.org/10.1111/j.1467-6486.1988.tb00039.x

Wong, E. M., Ormiston, M. E., & Tetlock, P. E. (2011). The effects of top management team integrative complexity and decentralized decision making on corporate social performance. *Academy of Management Journal, 54*, 1207–1228. https://doi.org/10.5465/amj.2008.0762

World Health Organization. (2015). *Key events in the WHO response to the Ebola outbreak.* Retrieved from http://www.who.int/csr/disease/ebola/one-year-report/who-response/en/

Zhu, J.-H. (1992). Issue competition and attention distraction: A zero-sum theory of agenda-setting. *Journalism & Mass Communication Quarterly, 69*, 825–836. https://doi.org/10.1177/107769909206900403

Zhu, J.-H., & McCombs, M. (1995). Capacity, diversity, and volatility of the public agenda: Trends from 1954 to 1994. *American Association for Public Opinion Research, 59*, 495–525. https://doi.org/10.1086/269491